

Advanced Turbine Concept

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Contains Proprietary Information

New Turbine Concept Goals

- ◆ Simplify design
- ◆ Make more compact
- ◆ Improve cooling of turbine section
- ◆ Improve efficiency
- ◆ Configure as either a compact auxiliary power unit (APU) or as thrust engine for aircraft

Proprietary Information

Turbine Design Overview

1. **Compressor and turbine sections combined into one part**
 - eliminates classical connecting shaft
 - gives more compact design
 - potentially reduces manufacturing costs

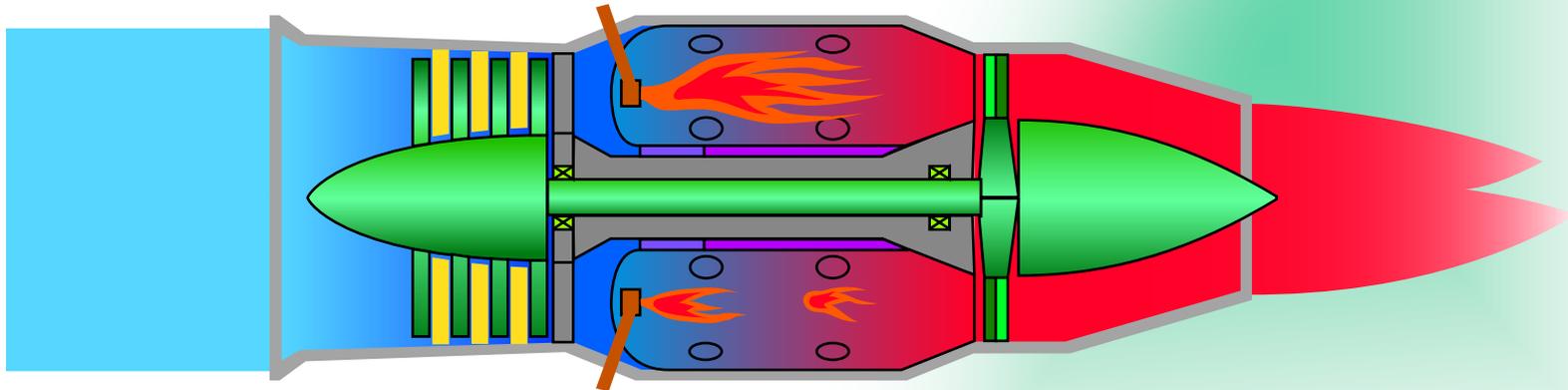
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Design Overview Continued

2. All input air is passed through hollow turbine-section blades and hollow turbine-nozzle veins
 - results in superior cooling of blades
 - allows cheaper materials to be used
 - preheats air before combustion for partial exhaust gas heat recovery
 - should allow engine to operate at higher temps resulting in higher efficiency
3. Alternator can be built into the rotor for ultra compactness when in APU configuration

Typical Jet Engine Layout

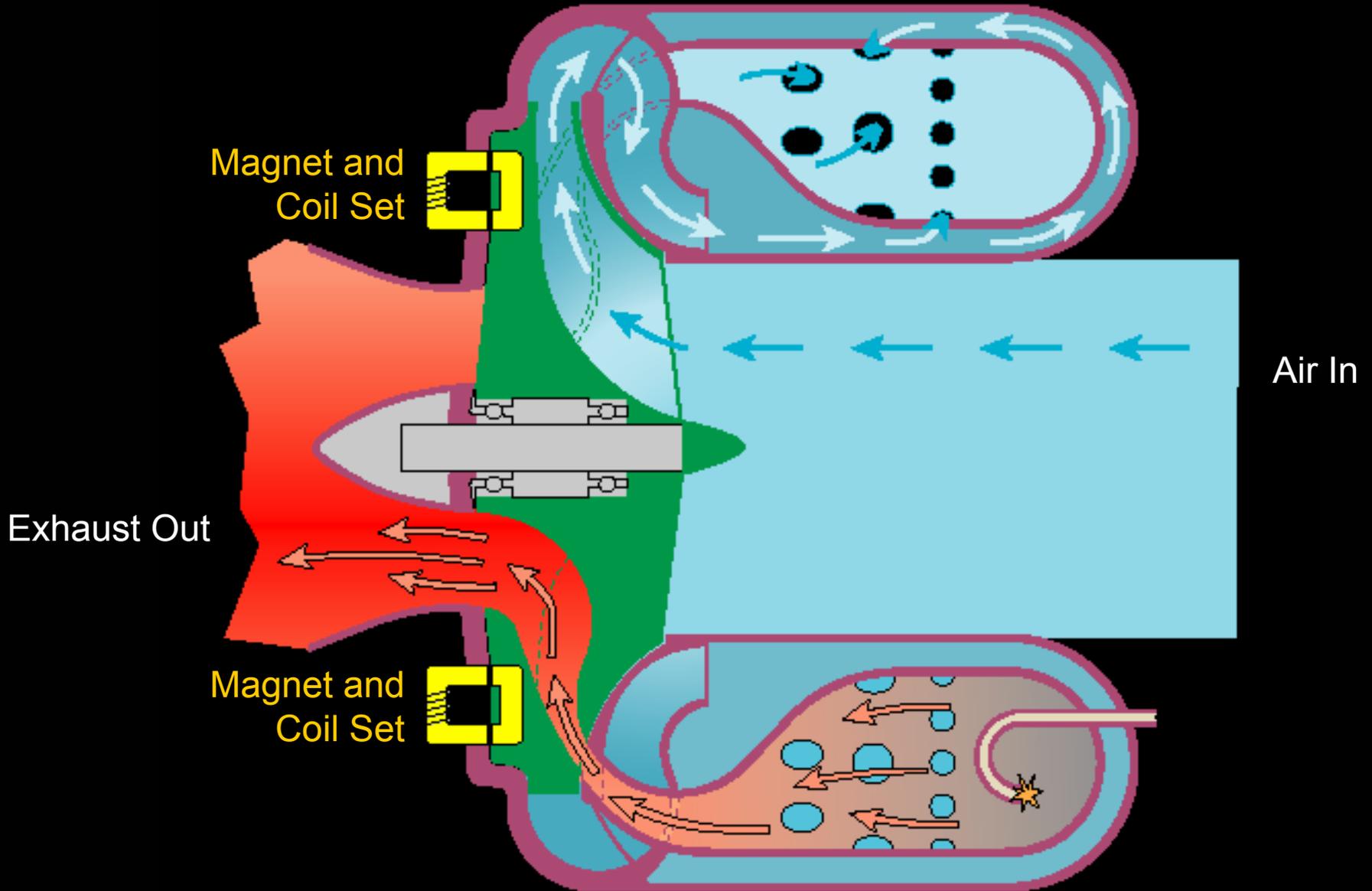
- Less dense air
- Compressed air
- Combustion & hot gases



Composed of three sections: compressor, combustor, and turbine

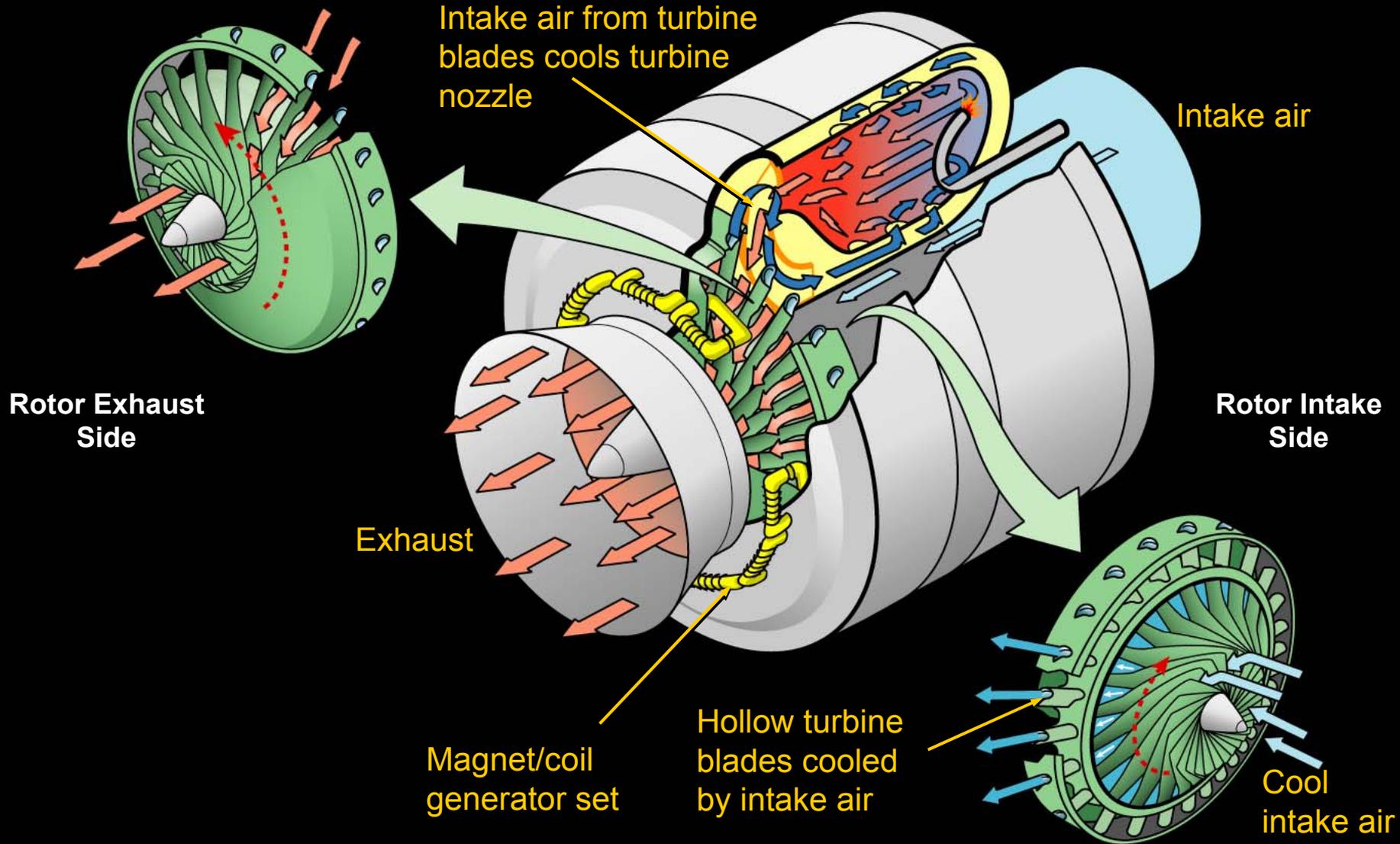
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Radial/Radial, Single Rotor Turbo Alternator APU



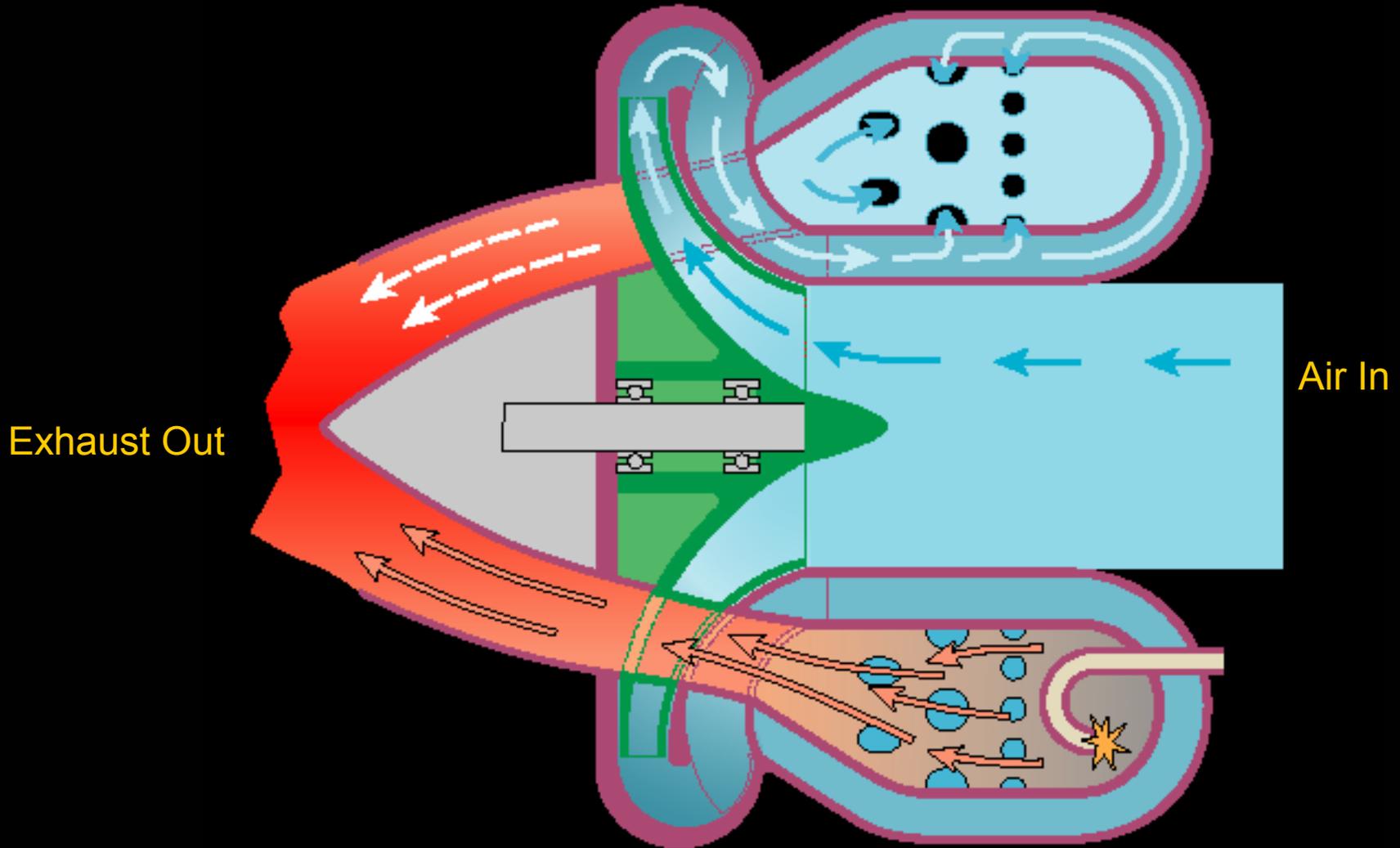
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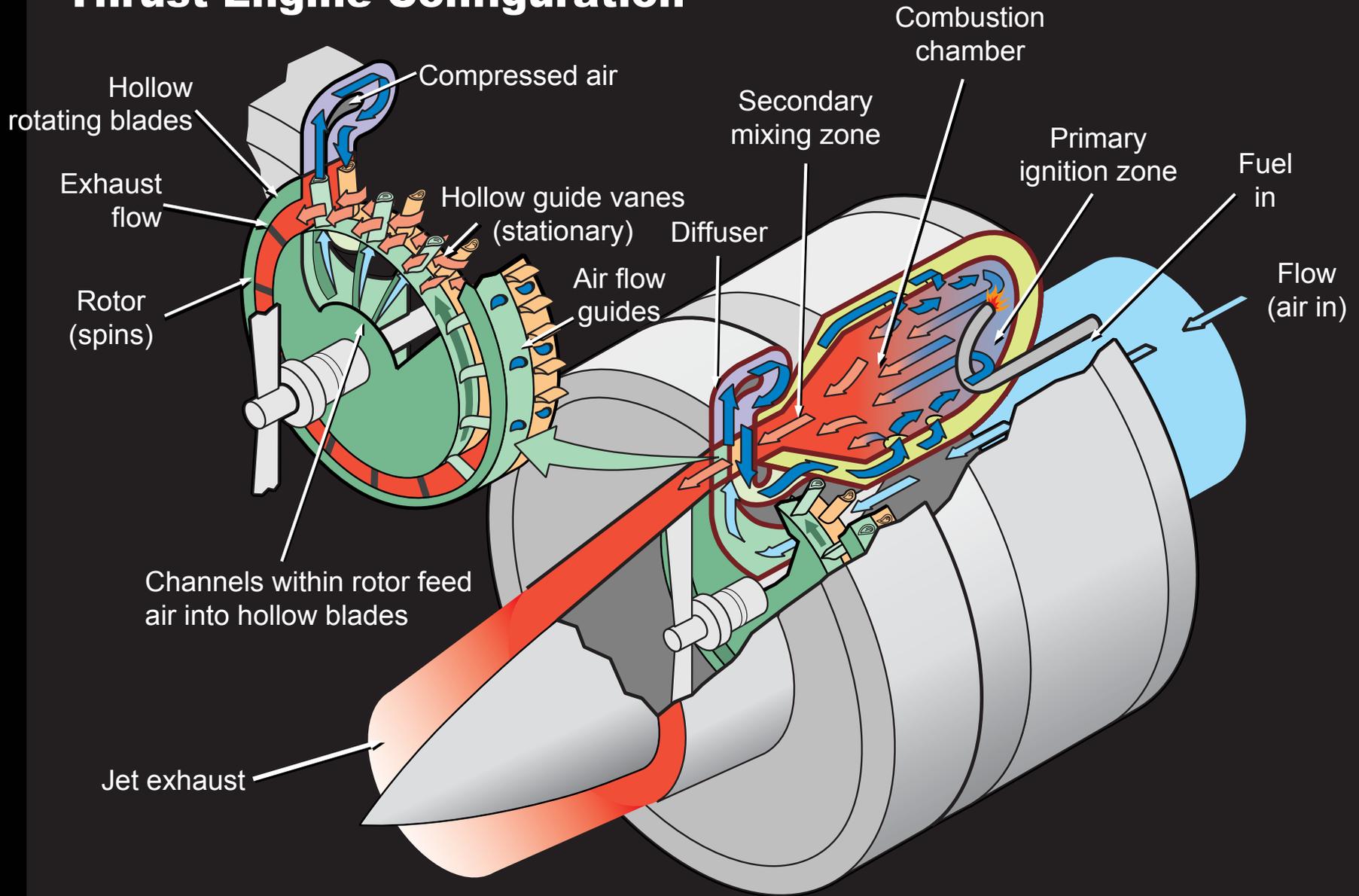
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Thrust Engine Configuration



Proprietary Information

Thrust Engine Configuration



Proprietary Information **Status**

- ◆ Patent portfolio being developed
- ◆ First turbine wheel cast in *Inconel*
- ◆ First turbine *spool-up* imminent in specially designed test rig
- ◆ Modeling indicates
 - aerodynamics basically correct
 - stresses well balanced in the design

First Inconel Rotor



Turbine Test Rig



Next Steps

- ◆ **Using the test rig, explore operational parameter space of the initial engine design**
 - estimate efficiency, identify design refinements/enhancements
 - goal completion date: 7/02
- ◆ **Analyze the data and recommend path forward**
 - run more advanced computer modeling analysis, benchmarked by test rig data
 - incorporate findings into design
 - build running turbine and APU
 - goal completion date: 12/02

Integration: LANL technologies provide a comprehensive package

- ◆ **New turbine concept**
- ◆ **Turbine design and development capabilities**
 - computer modeling
 - exotic diagnostics used to benchmark computer models
 - actual flow/velocity fields visualized
 - combustion species identified
 - temperatures mapped
- ◆ **Advanced turbine systems**
 - laser ignition
 - new fuel injection technology
 - vortex combustor

Los Alamos is seeking Partners

- ◆ **Partners are being sought**
 - to help in developing our new turbine engine
 - to license our new turbine engine and technologies
- ◆ **Can we help your company solve turbine diagnostics problems?**

Contact Information

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